Electricity

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Circuits and Laws

Kirchhoff's laws

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- - but there are special rules that can be applied and help analyze any circuit;
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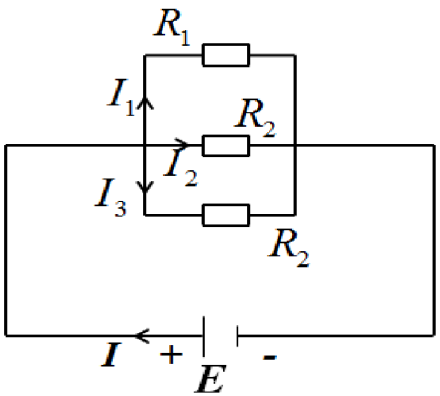
- - and states that at any junction point,
  the sum of all currents entering the junction,
  must equal the sum of all currents leaving the junction;
- - that is: $I = I_1 + I_2 + I_3$;



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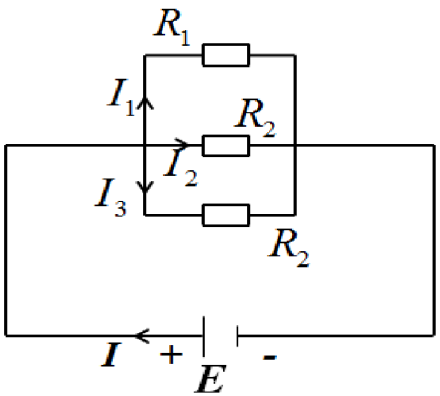

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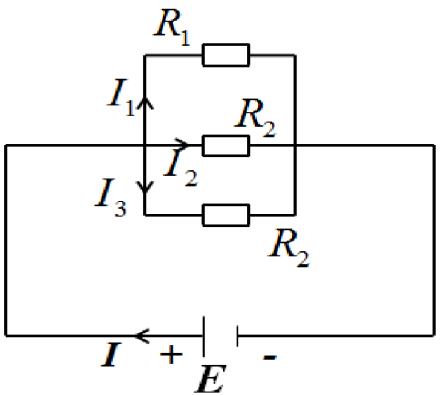

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- - Kirchhoff's second law or loop rule
- is based on the conservation of energy and states that
- - the net electromotive force around a closed circuit loop
  is equal to the sum of potential drops around the loop;
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  $I_1 R_1 - I_2 R_2 + I_3 R_3 = E_2 - E_3 - E_4$;

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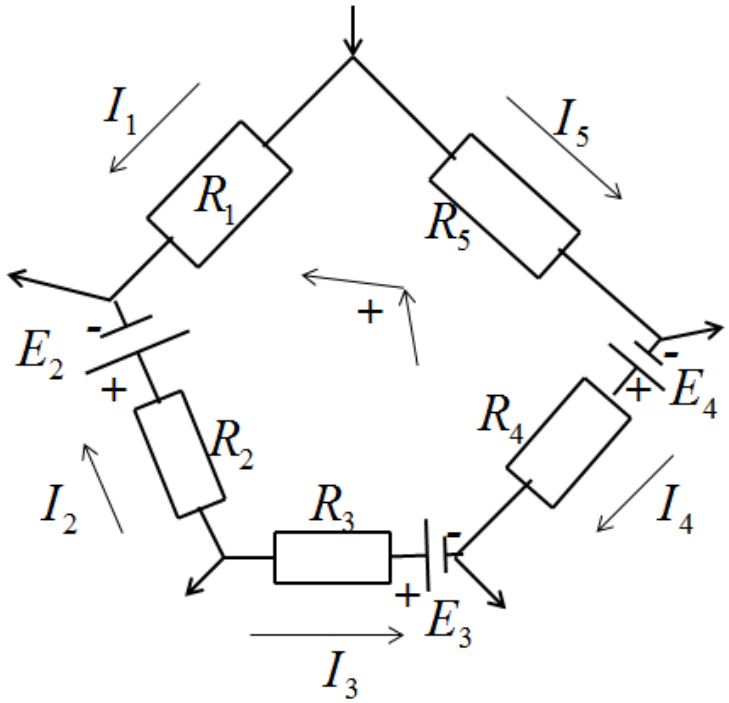

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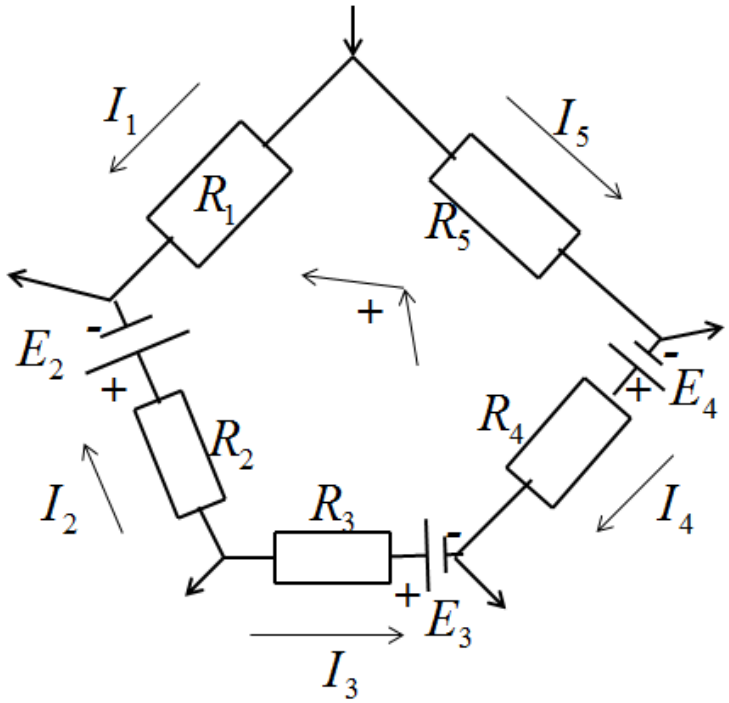

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- - the total voltage is the algebraic sum of their voltages
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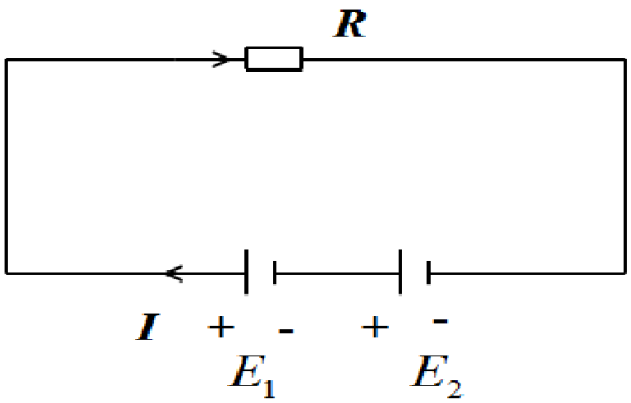

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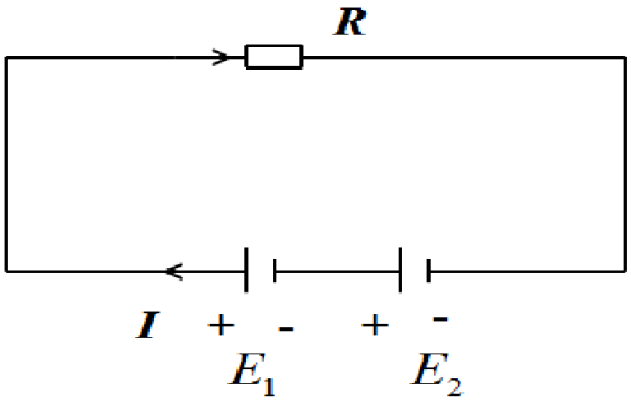

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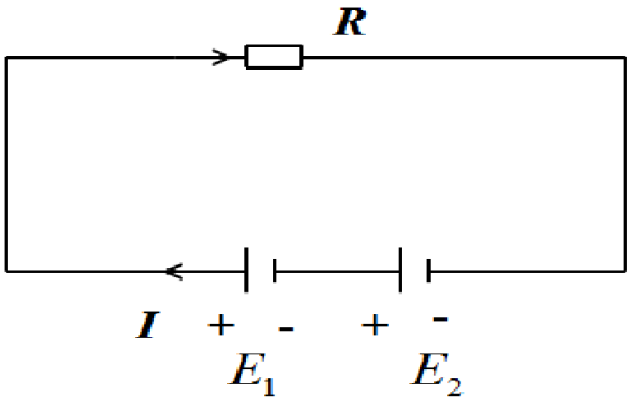

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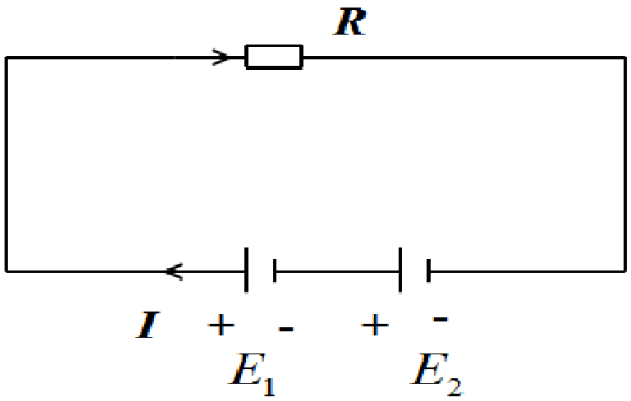

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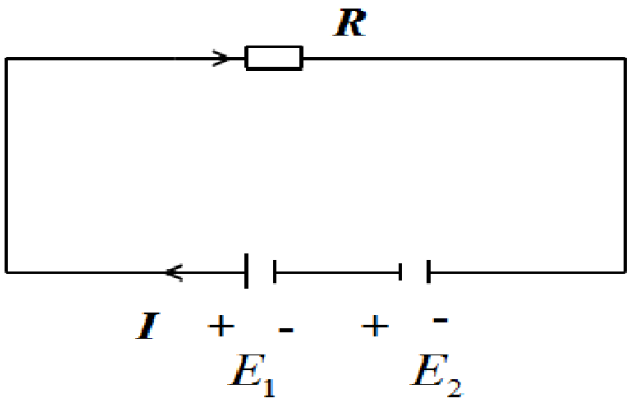

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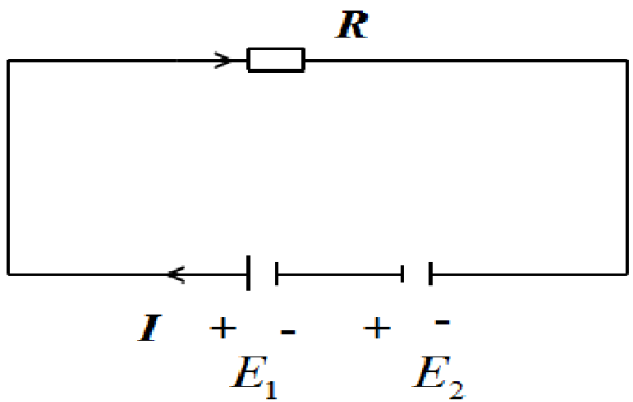

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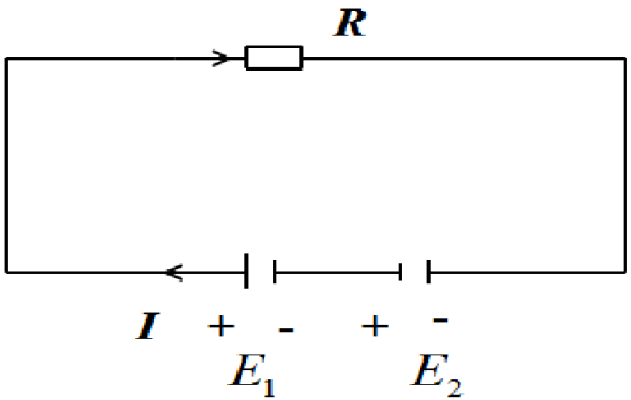

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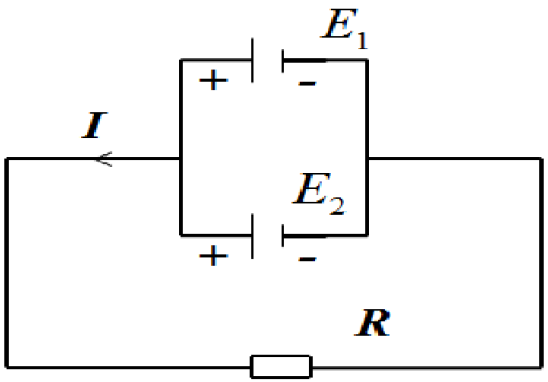

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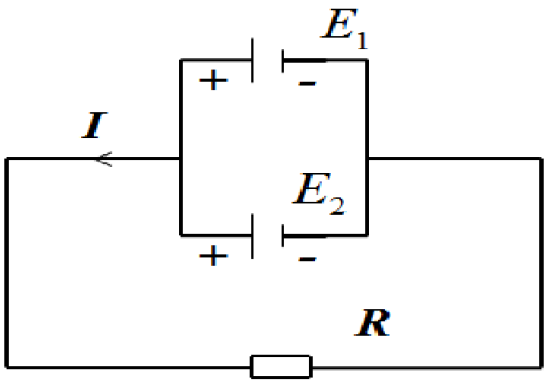

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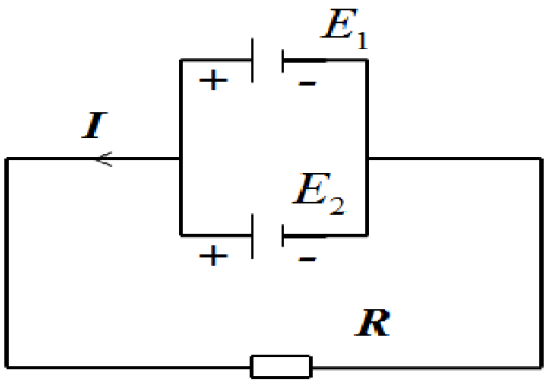

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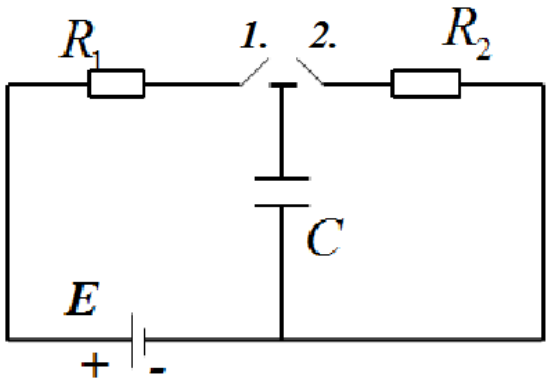
- - it is called *RC circuit*;
- - if we close switch 1.) only, current flows through the left part of the circuit;



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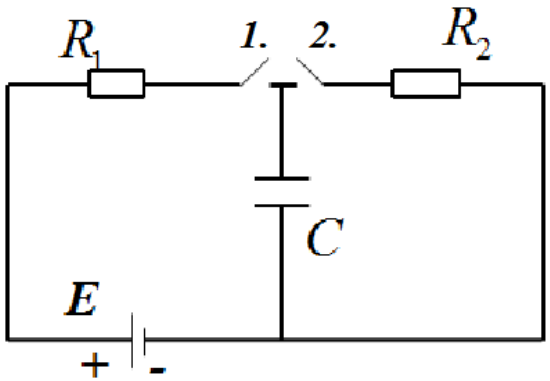

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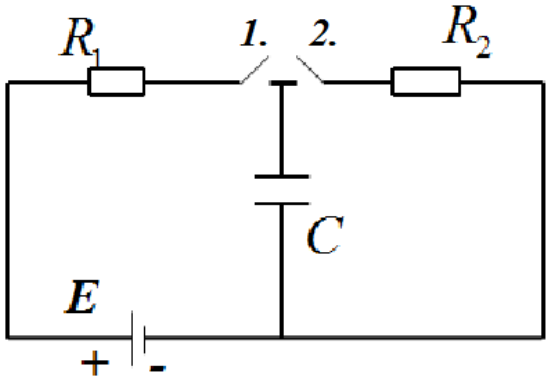

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- - until the voltage across the capacitor equals the *emf* of the battery;
- - from the conservation of energy, or Kirchhoff's loop rule results: $E = IR + \frac{Q}{C}$;
- - resistance R includes the internal resistance of the battery too;
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- - before we would reach this, both the intensity of the current flowing in the circuit
- - and the value of Q are functions of time;
- $I = \frac{dQ}{dt}$ and $E = R\frac{dQ}{dt} + \frac{Q}{C}$;
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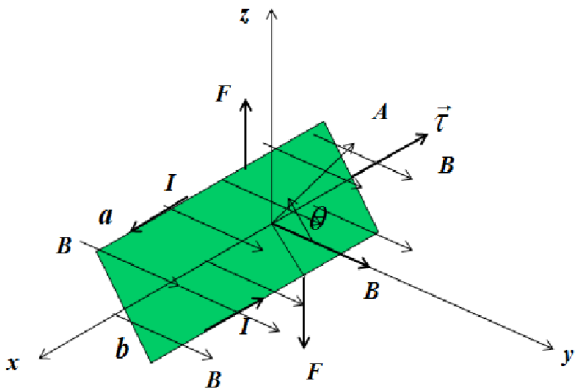
- - an ammeter is used to measure current;
- - the crucial part is a galvanometer which works on the principle of the force between a magnetic field
- - and a current-carrying coil of wire;



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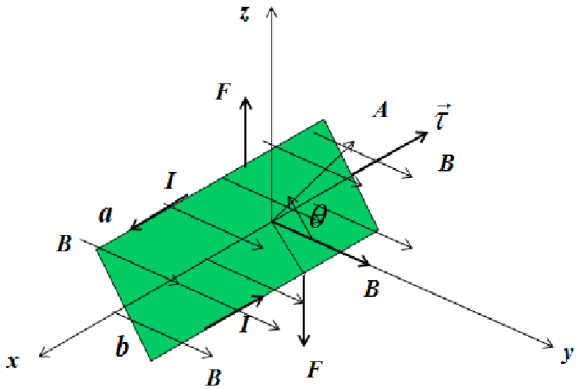

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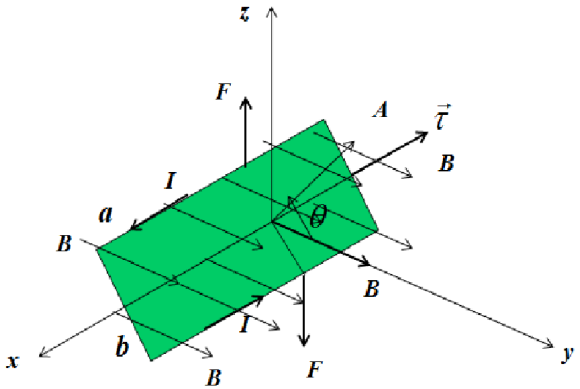

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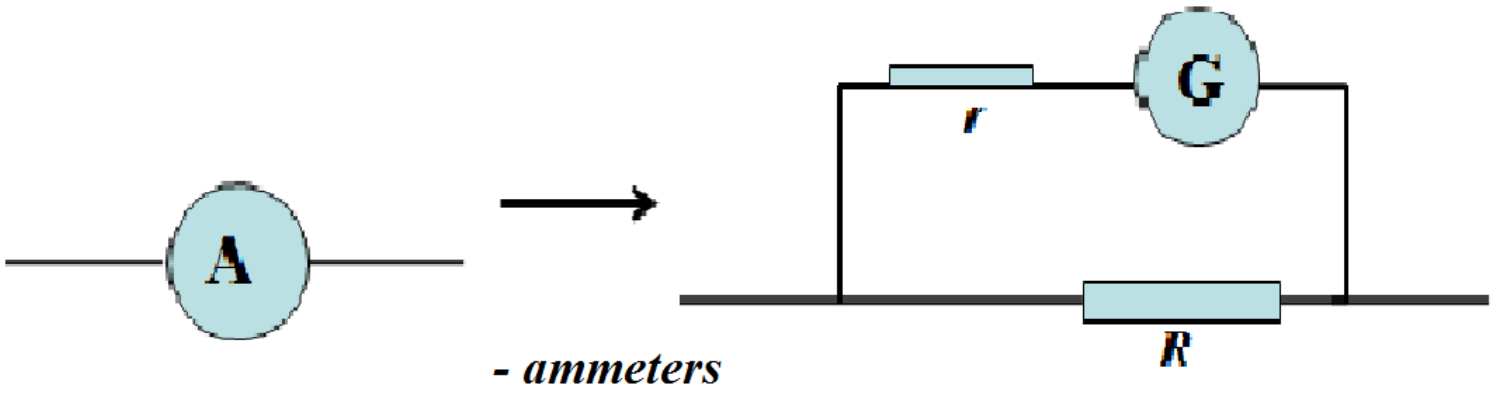

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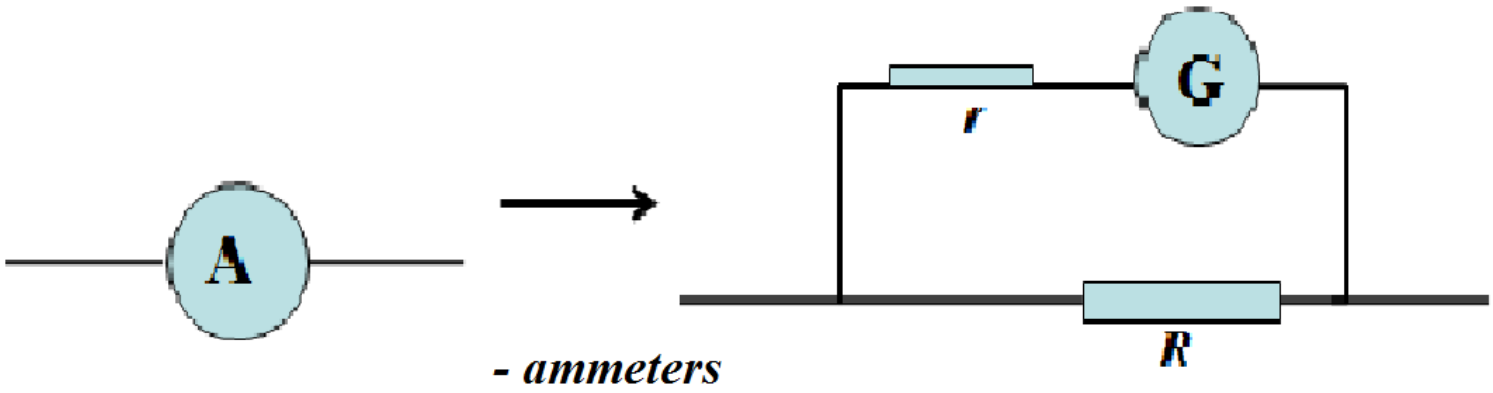

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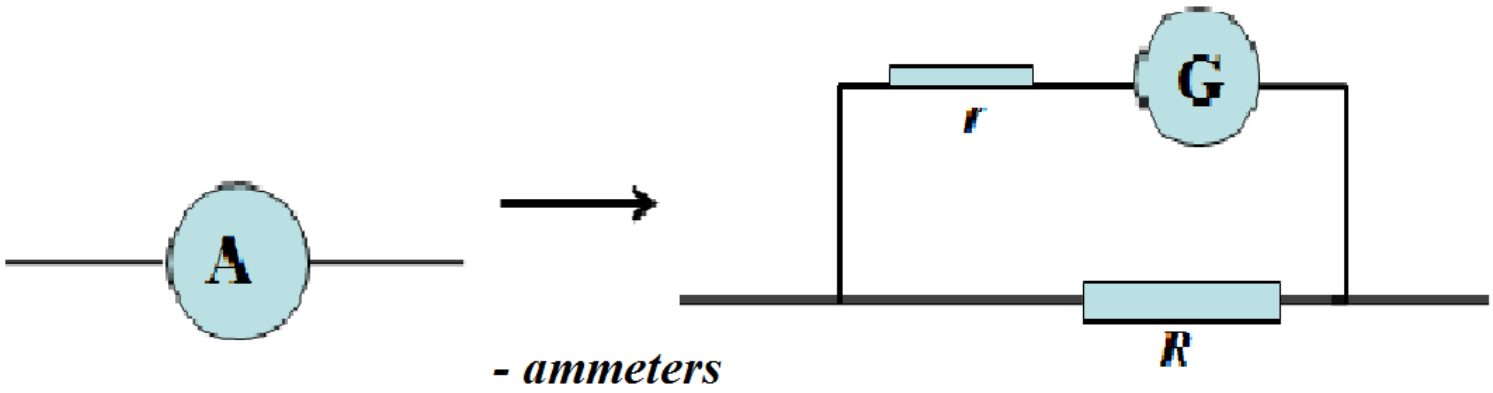

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- - a voltmeter also consists of a galvanometer and a resistor;
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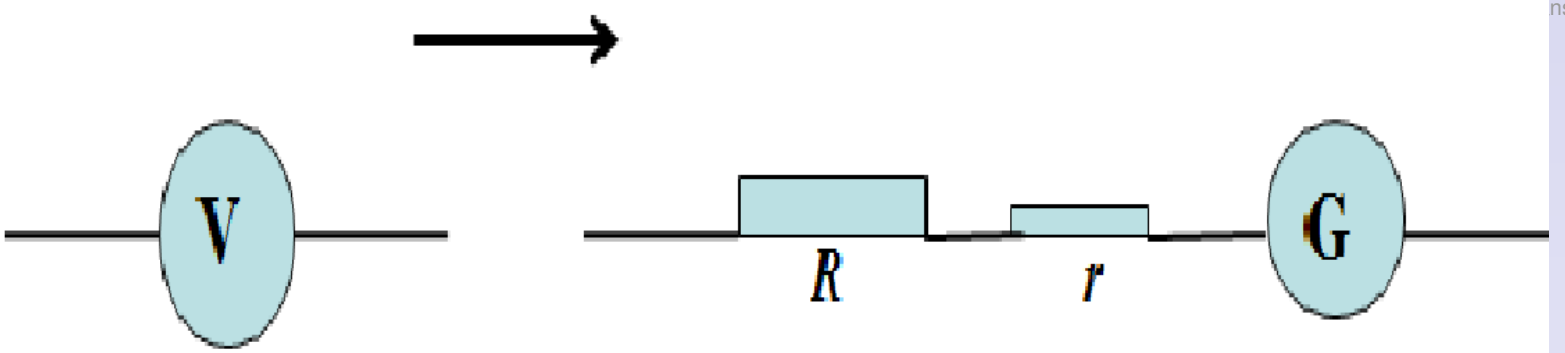

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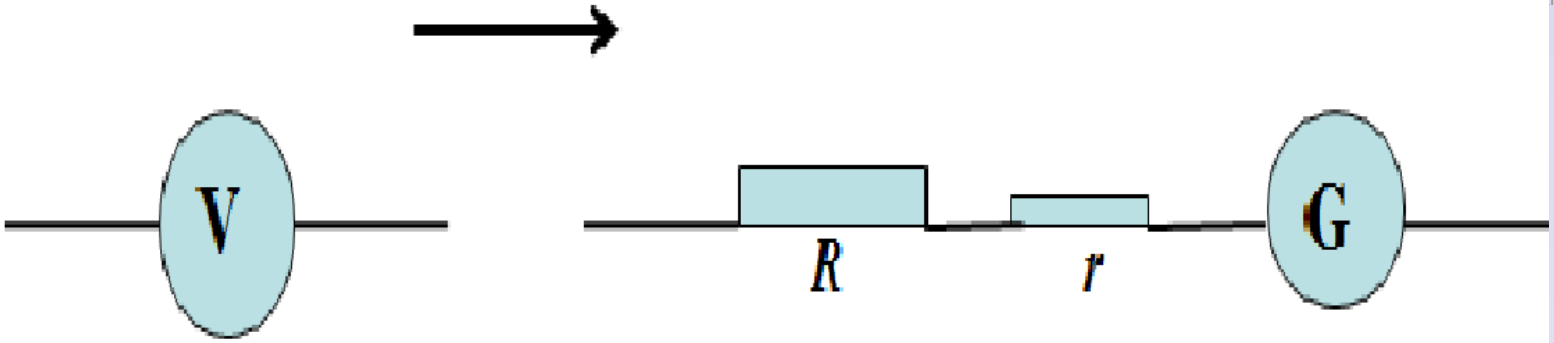

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- - a potentiometer is a device that measures potential differences;
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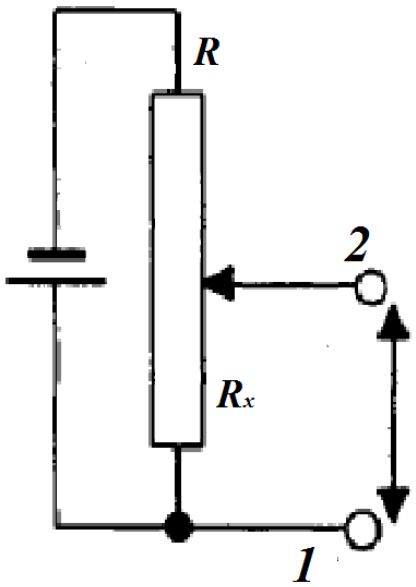
- - that forms an adjustable voltage divider producing a variable voltage output signal which is proportional to the physical position of the wiper;



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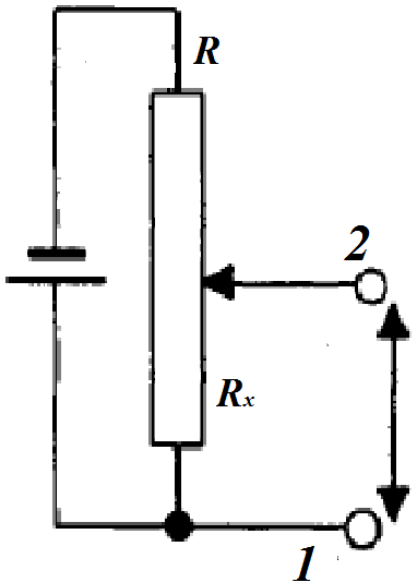

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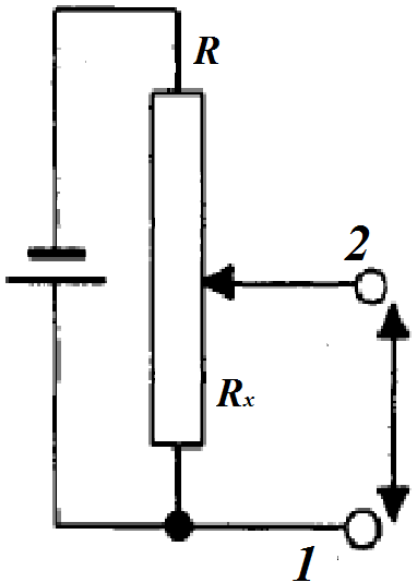

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Circuits and Laws
Kirchhoff's laws

The Electromotive Force - EMF
EMF - in Series and Parallel
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Ammeters - Voltmeters - Potentiometers
The Wheatstone Bridge and Transducers

The Wheatstone Bridge

- - the Wheatstone bridge can be used to make precise measurements of resistence;
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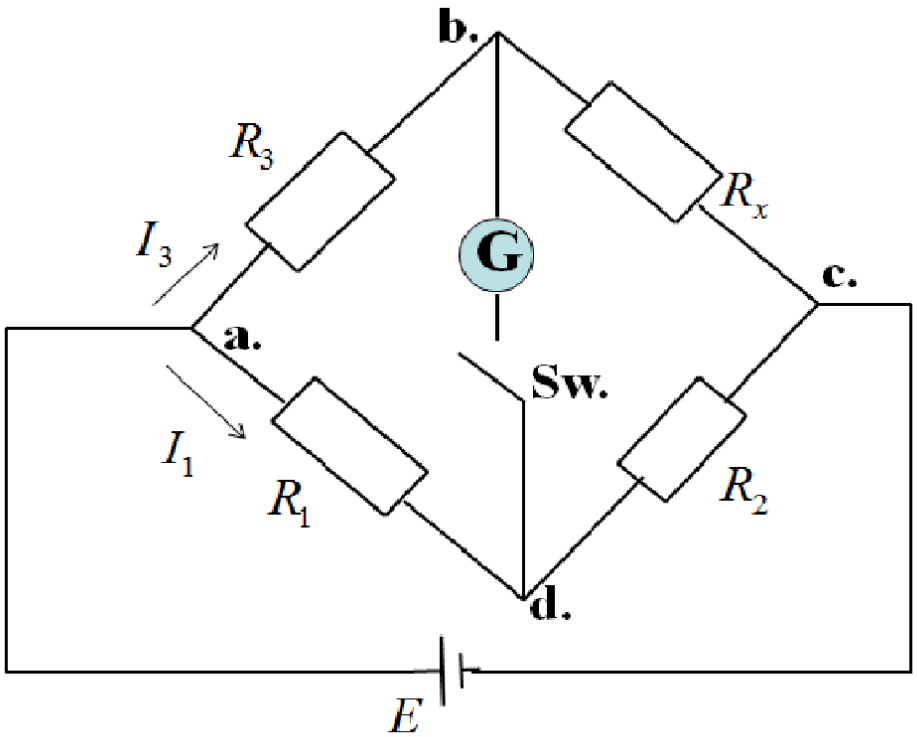

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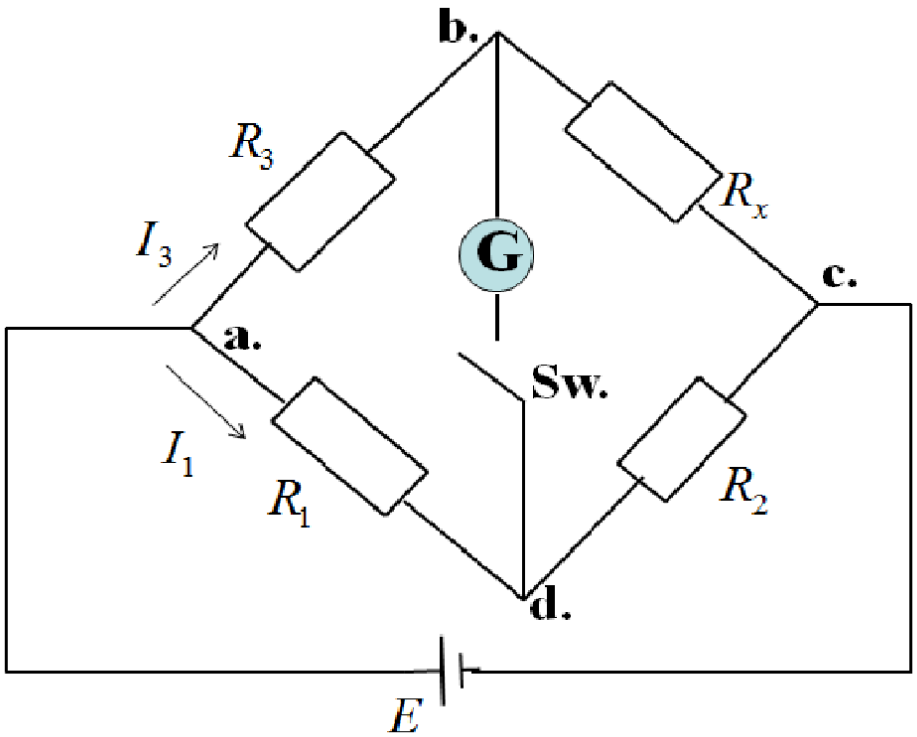

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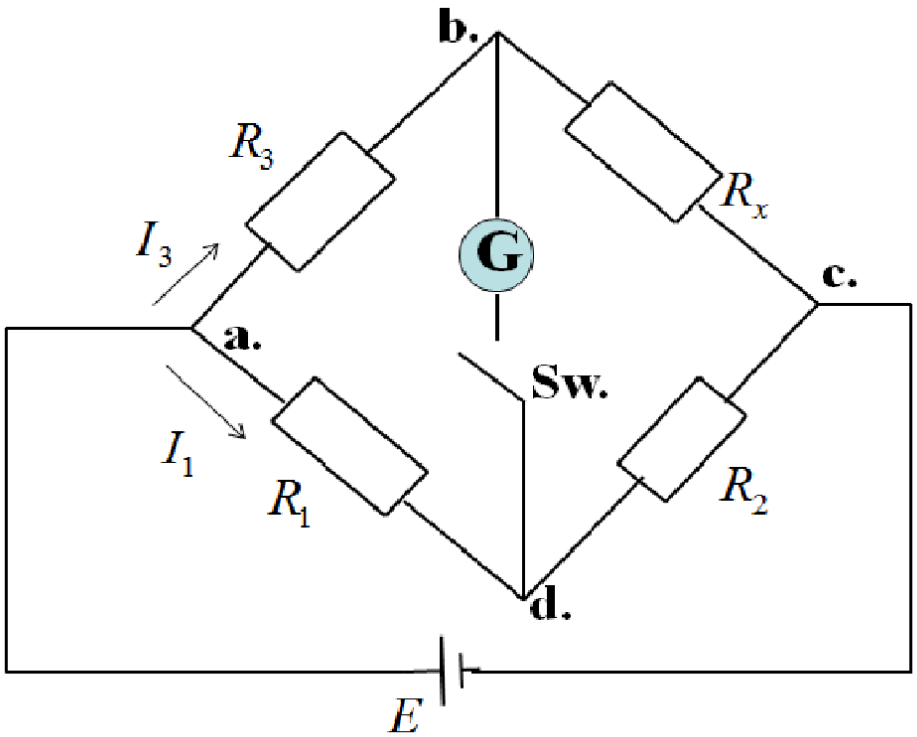

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- - for ex. a loudspeaker transforms electric energy into sound energy;
- - or a microphone changes sound into an electrical signal;
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